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(54) **FREE FALL WINDLASSES**

FREEFALLWINDEN

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Description

Technical area

[0001] This invention relates to the area of rope/chain anchor winch/windlasses and in particular to an anchor winch/windlass which can be used in a manner which permits free fall as well as controlled lowering and which can also be used as a conventional winch/windlass.

Background to the invention

[0002] For the purpose of the following discussion the words winches/ windlasses will be referred to for simplicity as winches.

[0003] Automatic winches are particularly suitable for use as anchor winches as when the anchor is being lowered the weight of the anchor can permit free falling of the rope or chain through the anchor winch. This is particularly useful in deep water anchoring. Preferably where anchoring is to take place in shallow water it is desirable that the anchor be lowered under the control of a motor.

[0004] A problem associated with trying to use anchor winches in free fall mode is that, if a boat has a deep chain locker, the weight of the chain hanging into the chain locker below the anchor winch can be greater than the weight of the anchor. Therefore the anchor cannot initially free fall despite an anchor winch being in free fall mode. The anchor will only free fall when the combined weight of the anchor and chain hanging over the bow roller is greater than that of the chain hanging down into the chain locker.

[0005] Winches are known which are capable of operating in free fall mode and are also able to permit controlled motorised lowering and braking of the falling anchor. For example, EP 0479624A discloses a winch which can permit free-fall by means of two co-axial cones connected about a drive shaft whereby a first cone can be caused to assume one of two axial positions relative to the second cone, the arrangement being such that a rope or chain passing between the two cones can be driven by the winch when the second cone is in one of its two positions and can free fall when the second cone is in the other of its two positions.

Outline of the Invention

[0006] It is an object of this invention to provide a winch which helps to avoid the above described problems by providing a winch having means such that when it is initially driven in reverse, the anchor rope/chain is fed out until the weight of the anchor and rope/chain combination is sufficient to trigger means to permit free fall of the anchor but which winch can also permit controlled motorised lowering and braking of the falling anchor in any position during its downward fall. It is a further object of the invention that the winch be able to be used as a conventional winch when required.

[0007] According to the present invention there is provided a winch with means to automatically provide free fall of an anchor, said winch including means to drive the anchor's attached rope/chain out of a storage area until the weight of the anchor and attached rope/chain is sufficient to activate a means to disengage the drive mechanism such that the anchor is permitted to free fall; the winch also having means to provide controlled motorised lowering and braking of the falling anchor at any time during its downwards fall but which may also be used as a conventional power up power down winch; the winch characterised in that it includes a drive shaft with a clutch cone keyed to it, which clutch cone provides close engagement within a bore in a rope/chain gypsy.

[0008] It is preferred that the conversion to a conventional winch be effected by disengaging a clutching and declutching pawl.

[0009] It is further preferred that the winch be able to be controlled remotely or at the winch itself.

[0010] It is preferred also that the winch of the invention is fitted with a rope/chain gypsy allowing it to use all rope, all chain or a rope/chain combination. The requirements of this anchor winch are that when lifting the anchor the gypsy must be driven with little or no loss of drive between the main shaft and the gypsy. It must permit quick and easy free fall of the anchor when required.

[0011] In order that the invention may be more readily understood we shall describe by way of non limiting example one specific embodiment thereof with reference to the accompanying drawings.

Description of the drawing figures

[0012]

Fig.1 shows the winch in elevation and partly in section

Fig.2 is an exploded diagram of the winch components

[0013] As shown in Figure 1 the invention provides an anchor winch 100 having a clutching declutching pawl 24 such that the anchor winch can be used as a conventional winch by disengaging the clutching/declutching pawl (the pawl).

[0014] The anchor winch 100 of the invention includes a base 19 which is coupled to a gearbox, planetary box, or a worm and worm wheel drive. An electric or hydraulic motor can power the gear drive and the radial movement is transferred from the motor to the gear drive.

[0015] The main shaft 17 is fitted to a base plate 1 which has an internal bearing to locate the main shaft 17 which is keyed 18 to the gear drive giving a positive drive. The drive from the main shaft is transferred to a rope/chain gypsy 10 via a clutch cone drive 12. The clutch cone drive 12 has an internal bore and an internal keyway and is fitted onto the main shaft 17 with a key fitted between the clutch cone and the main shaft. The clutch

cone is held in position on the main shaft by two circlips 11, 13.

[0016] The outside diameter of the clutch cone 12 is tapered 25 degrees while the underside of the gypsy 10 has a section bored to the same angle and diameter as the clutch cone to allow the gypsy to sit over the clutch cone and have the best drive possible.

[0017] The gypsy 10 which sits over the main shaft 17 and on the clutch cone 12 is bored 0.15mm larger than the main shaft to allow it to rotate freely on the main shaft. The gypsy has no positive drive between itself, the clutch cone or the main shaft. Located above the gypsy is a PVC clutch nut washer 9 which is used to assist in the engaging and disengaging of the clutch nut 8.

[0018] The clutch nut 8 is fitted to the main shaft 17 and when the main shaft is driven in the lifting direction the clutch nut 8 is held in position by a spring 4 and loaded plunger pin 5 against a pawl 24 which is mounted on to the anchor winch chain cover/pawl housing 23. This allows the clutch nut to be driven down the main shaft until it tightens against the PVC clutch nut washer and the clutch cone forcing the gypsy to rotate in the same direction as the main shaft. This rotation pulls the rope or chain through the gypsy lifting the anchor.

[0019] When the main shaft is driven in the opposite direction the plunger pin 5 holds itself against the pawl 24 which forces the clutch nut 8 to loosen and be driven back up the main shaft releasing the gypsy which will now permit free fall. A clutch nut retaining washer 2 is bolted to the top of the main shaft so that when the clutch nut 8 is in free fall mode it will not screw itself off the main shaft. If the pawl 24 is disengaged the anchor winch will operate as a conventional anchor winch.

[0020] The plunger pin 5 which is fitted to the outer diameter of the clutch nut 8 holds the clutch nut against the pawl 24 so that when the main shaft 17 is rotated in either direction the clutch nut is driven up or down until it tightens on the gypsy or clutch nut retaining washer. When this happens the plunger pin 5 is forced back into the clutch nut 8 to allow the clutch nut to rotate and not over tighten. Once the clutch nut rotates past the pawl the plunger pin returns to its normal position.

[0021] The plunger pin 5 is allowed to move because of a spring 4 installed behind it. The spring allows the plunger pin to be pushed in when the clutch nut is under load allowing the clutch nut to rotate. Once the clutch nut has rotated past the pawl the spring pushes the plunger pin back to its normal position, this repeats itself once every revolution until the anchor winch is stopped or its direction changed.

[0022] The pawl 24 which is mounted to the chain cover/pawl housing 23 is mounted by a pivot point roll pin 25 to enable the pawl to be engaged for automatic downwards free fall or disengaged for conventional anchor winch operation. The pawl 24 is machined with various angles at the plunger pin 5 contact areas to allow it to have two functions. It holds the clutch nut in position to engage the gypsy and also, when the clutch nut is rotated

in the opposite direction, it will disengage the gypsy allowing the anchor to free fall.

[0023] When the clutch nut 8 is to be engaged the anchor winch 100 is operated in lift mode, the plunger pin 5 then pushes against the top section of pawl 24 which has a 79 degree approach angle to the plunger pin which angle does not allow the plunger pin to depress. This holds the clutch nut 8 in position to be tightened.

[0024] As the clutch nut 8 tightens the plunger pin moves down the face of the pawl 24 and once the clutch nut is tightened the position on the pawl where the plunger pin now sits has been machined with a 23 degree approach angle which allows the plunger pin to depress very easily. The same angles have been used to disengage the clutch nut 8 and have been machined on the opposite side of the pawl. Although these angles are used in this preferred embodiment of the invention any appropriate angles which achieve the same effect may be used.

[0025] A clutch nut retaining washer 2 is bolted to the top of the main shaft 17 and acts to stop the clutch nut becoming undone when the anchor winch is in reverse or free fall. This washer 2 has a PVC wear washer 3 fitted to its underside to reduce friction between the clutch nut 8 and its retaining washer 2 and ensure that the clutch nut returns to its lifting position when the winch is in forward or lift mode.

[0026] Also provided are a ratchet pawl 15 and spring 14 to assist the anchor winch at the start of free fall at which time the weight of the anchor and rope/chain may be insufficient to effect free fall. For this reason the ratchet pawl 15 and spring 14 are fitted to the clutch cone 12 the clutch cone having a cavity machined on one side of its tapered surface which allows the ratchet pawl and spring to sit in the clutch cone but below the bearing area or tapered surface.

[0027] The tapered section of the gypsy 10 bore where the clutch cone 12 sits has a groove machined down one side of the tapered surface. This groove catches the front or leading edge of the ratchet pawl creating a positive drive between the clutch cone and the gypsy.

[0028] This positive drive will only occur when the anchor winch is in reverse or free fall mode. This positive drive allows the anchor winch to pull chain up and out of the chain locker allowing the anchor to lower. Once the anchor and chain that has passed over the bow roller weighs more than the chain hanging down into the chain locker the anchor will begin to free fall. The ratchet pawl will then release itself from the groove in the gypsy acting like a ratchet in reverse.

[0029] The anchor winch of the invention therefore has the capacity to allow automatic lowering of an anchor to simulate continuous free fall or it may be used as a conventional winch by disengaging pawl 24. It may also be operated at the winch or remotely by a switching means.

[0030] Whilst we have described herein one specific embodiment of the invention it is to be understood that variations and modifications in this can be made within the scope of the claims.

Claims

1. A winch (100) which is provided with means to automatically provide free fall of an anchor, said winch including means to drive the anchor's attached rope/chain out of a storage area until the weight of the anchor and attached rope/chain is sufficient to activate a means to disengage the drive mechanism such that the anchor is permitted to free fall; the winch also having means to provide controlled motorised lowering and braking of the falling anchor at any time during its downwards fall but which may also be used as a conventional power up power down winch; the winch **characterised in that** it includes a drive shaft (17) with a clutch cone (12) keyed to it, which clutch cone provides close engagement within a bore in a rope/chain gypsy (10). 5
2. A winch (100) as claimed in claim 1 wherein the means for automatically providing free fall for a winch is provided by a pawl (24) which can be disengaged for conventional motorised winch operation. 10
3. A winch (100) as claimed in claim 2 wherein the gypsy is able to rotate freely on the drive shaft. 15
4. A winch (100) as claimed in claim 3 having a clutch nut (8) held in position against the pawl (24) by a spring (4) and loaded plunger pin (5) when the drive shaft is driven in a lifting direction and which clutch nut is driven down the shaft (17) and tightens with respect to the clutch cone (12) causing the gypsy (10) to rotate in the same direction as the shaft. 20
5. A winch (100) as claimed in claim 4 wherein rotation of the drive shaft (17) in an opposite direction causes the plunger pin (5) to be held against the pawl (24) thereby forcing the clutch nut (8) to loosen and be driven up the drive shaft and cause the gypsy to be released and operate in free fall mode. 25
6. A winch (100) as claimed in claim 4 or claim 5 wherein the spring (4) allows the plunger pin (5), which is fitted to the outside diameter of the clutch nut (8), to be pushed in relative to the clutch nut when the clutch nut is under load allowing the clutch nut to rotate so that, once the clutch nut has passed the pawl (24) the spring pushes the plunger out again. 30
7. A winch (100) as claimed in claim 6 wherein a top section of the pawl (24) has an approach angle to the plunger (5) when in lift mode which does not allow the plunger to depress. 35
8. A winch (100) as claimed in claim 7 wherein, as the clutch nut (8) tightens and the plunger (5) moves down the pawl (24), when the clutch nut has tightened the approach angle of the pawl permits the 40

plunger to be easily depressed.

9. A winch (100) as claimed in any preceding claim in which means are provided to create positive drive between the gypsy (10) and the clutch cone (12) which positive drive only occurs when the winch is in reverse or free fall mode. 45
10. A winch (100) as claimed in claim 9 wherein the positive drive means is effected by the engagement of a ratchet pawl (15) on the clutch cone (12) with a groove in the gypsy (10) bore. 50
11. A winch (100) as claimed in claim 10 whereby the positive drive allows the winch to pull rope and/or chain from a locker until the weight of the anchor and rope and/or chain passed out of the locker exceeds the weight of that within it and causes the anchor to free fall and the ratchet pawl (15) to be released. 55

Patentansprüche

1. Winsch (100), versehen mit Mitteln zum automatischen Freifallen eines Ankers, wobei die Winsch Mittel umfasst, um die am Anker angebrachte Leine/Kette aus einem Lagerbereich zu bewegen bis das Gewicht des Ankers und der angebrachten Leine/Kette ausreicht, um ein Mittel zum Lösen des Bewegungsmechanismus zu aktivieren, so dass der Anker frei fallen kann; wobei die Winsch auch Mittel aufweist, um ein kontrolliertes motorisiertes Absenken und Bremsen des fallenden Ankers zu jedem Zeitpunkt während seines Abwärtsfallens zu ermöglichen, wobei die Winsch jedoch auch als eine herkömmliche Anschalt-/Ausschaltwinsch verwendet werden kann; wobei die Winsch **dadurch gekennzeichnet ist, dass** sie eine Antriebswelle (7) mit einem damit verkeilten Kupplungskonus (12) umfasst, wobei der Kupplungskonus einen engen Eingriff in eine Bohrung in einer Leinen/Kettennuss (10) ermöglicht. 60
2. Winsch (100) nach Anspruch 1, bei welcher das Mittel zum automatischen Freifallen für eine Winsch durch eine Klinke (24) bereitgestellt wird, welche für eine herkömmliche motorisierte Winschbetätigung gelöst werden kann. 65
3. Winsch (100) nach Anspruch 2, bei welcher die Leinen/Kettennuss auf der Antriebswelle frei rotieren kann. 70
4. Winsch (100) nach Anspruch 3, mit einer Kupplungsnuss (8), die in Position gegen die Klinke (24) gehalten wird durch eine Feder (4) und einen belasteten Kolbenpin (5) wenn die Antriebswelle in eine Heberichtung bewegt wird, wobei die Kupplungsnuss auf 75

der Welle (17) abwärts bewegt wird und anzieht in Bezug auf den Kupplungskonus (12), wodurch bewirkt wird, dass die Leinen/Kettennuss (10) in die gleiche Richtung dreht wie die Welle.

5. Wunsch (100) nach Anspruch 4, bei welcher eine Drehung der Antriebswelle (17) in einer entgegen gesetzten Richtung bewirkt, dass der Kolbenpin (5) gegen die Klinke (24) gehalten wird, wodurch die Kupplungsnuss (8) gelöst und an der Antriebswelle aufwärts bewegt wird und bewirkt wird, dass die Leinen/Kettennuss freigesetzt wird und im Freifallmodus arbeitet. 10
6. Wunsch (100) nach Anspruch 4 oder Anspruch 5, bei welcher die Feder (4) dem Kolbenpin (5), der an den Außendurchmesser der Kupplungsnuss (8) angepasst ist, ermöglicht, relativ zur Kupplungsnuss bewegt zu werden, wenn die Kupplungsnuss unter Last ist, wodurch der Kupplungsnuss ermöglicht ist zu drehen, so dass die Feder den Stempel wieder herausdrückt wenn die Kupplungsnuss die Klinke (24) passiert hat. 15
7. Wunsch (100) nach Anspruch 6, bei welcher ein oberer Bereich der Klinke (24) einen Annäherungswinkel zum Kolben (5) im Hebemodus hat, der nicht ermöglicht, dass der Kolben herabdrückt. 20
8. Wunsch (100) nach Anspruch 7, bei welcher, da die Kupplungsnuss (8) anzieht und der Kolben (5) sich an der Klinke (24) abwärts bewegt wenn die Kupplungsnuss angezogen hat, der Annäherungswinkel der Klinke ermöglicht, dass der Stempel in einfacher Weise herab gedrückt wird. 25
9. Wunsch (100) nach einem der vorherigen Ansprüche, bei welcher Mittel vorgesehen sind, um einen Direktantrieb zwischen der Leinen/Kettennuss (10) und dem Kupplungskonus (12) zu schaffen, wobei der Direktantrieb nur dann vorliegt, wenn die Wunsch im Umkehr- oder Freifallmodus ist. 30
10. Wunsch (100) nach Anspruch 9, bei welcher das Direktantriebsmittel geschaffen wird, indem eine Rastklinke (15) auf den Kupplungskonus (12) mit einer Rille in der Leinen/Kettennuss (10)-Bohrung zu greift. 35
11. Wunsch (100) nach Anspruch 10, bei welcher der Direktantrieb der Wunsch ermöglicht, dass die Leine/Kette von einem Kettenkasten herausgezogen wird bis das Gewicht des Ankers und der aus dem Kettenkasten gezogenen Leine und/oder Kette das Gewicht jener darin übersteigt und bewirkt wird, dass der Anker frei fällt und die Rastklinke (15) freigesetzt wird. 40

Revendications

1. Treuil (100) qui est muni de moyens pour permettre automatiquement une chute libre d'une ancre, ledit treuil incluant des moyens pour entraîner la corde/chaîne fixée à l'ancre hors d'une zone de stockage jusqu'à ce que le poids de l'ancre et de la corde/chaîne attachée soit suffisant pour activer un moyen pour sortir de prise le mécanisme d'entraînement de sorte que l'ancre peut tomber librement; le treuil ayant également des moyens pour permettre un abaissement et freinage motorisé contrôlé de l'ancre qui tombe à tout moment durant sa chute mais qui peut également être utilisée comme treuil de mise sous/mise hors tension; le treuil étant **caractérisé en ce qu'il** comporte un arbre d'entraînement (17) avec un cône d'embrayage (12) claveté à celui-ci, ledit cône d'embrayage réalise une prise bien ajustée avec un perçage dans un barbotin de corde/chaîne (10). 5
2. Treuil (100) selon la revendication 1, dans lequel le moyen pour permettre automatiquement une chute libre pour un treuil est réalisé par un cliquet (24) qui peut être sorti de prise pour une opération de treuil classique motorisée. 10
3. Treuil (100) selon la revendication 2, dans lequel le barbotin est apte à tourner librement sur l'arbre d'entraînement. 15
4. Treuil (100) selon la revendication 3, ayant un écrou d'embrayage (8) maintenu en position contre le cliquet (24) par un ressort (4) et un axe de plongeur chargé (5) lorsque l'arbre d'entraînement est entraîné dans une direction de levage, et ledit écrou d'embrayage est entraîné vers le bas de l'arbre (17) et se resserre par rapport au cône d'embrayage (12) en amenant le barbotin (10) à tourner dans la même direction que l'arbre. 20
5. Treuil (100) selon la revendication 4, dans lequel la rotation de l'arbre d'entraînement (17) dans une direction opposée amène l'axe de plongeur (5) à être tenu contre le cliquet (24) en forçant ainsi le relâchement de l'écrou d'embrayage (8) et son entraînement par l'arbre d'entraînement et amène le barbotin à être libéré et à fonctionner en mode de chute libre. 25
6. Treuil (100) selon la revendication 4 ou la revendication 5, dans lequel le ressort (4) permet à l'axe de plongeur (5), qui est ajusté au diamètre extérieur de l'écrou d'embrayage (8), d'être poussé relativement à l'écrou d'embrayage lorsque l'écrou d'embrayage est sous charge en permettant à l'écrou d'embrayage de tourner de telle sorte que, lorsque l'écrou d'embrayage a passé le cliquet (24), le ressort pousse le plongeur à nouveau vers l'extérieur. 30

7. Treuil (100) selon la revendication 6, dans lequel une section supérieure du cliquet (24) a un angle d'approche au plongeur (5) en mode de levage qui ne permet pas l'enfoncement du plongeur.
- 5
8. Treuil (100) selon la revendication 7, dans lequel, lorsque l'écrou d'embrayage (8) se resserre et que le plongeur (5) descend le cliquet (24), lorsque l'écrou d'embrayage s'est resserré, l'angle d'approche du cliquet permet au plongeur d'être enfoncé facilement.
- 10
9. Treuil (100) selon l'une quelconque des revendications précédentes, dans lequel des moyens sont prévus pour créer un entraînement positif entre le barbotin (10) et le cône d'embrayage (12), ledit entraînement positif a lieu seulement lorsque le treuil est en mode de chute inverse ou libre.
- 15
10. Treuil (100) selon la revendication 9, dans lequel le moyen d'entraînement positif est effectué par la mise en prise d'un cliquet de rochet (15) sur le cône d'embrayage (12) avec une rainure dans le perçage de barbotin (10).
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- 25
11. Treuil (100) selon la revendication 10, dans lequel l'entraînement positif permet au treuil de tirer la corde et/ou chaîne d'un organe de blocage jusqu'à ce que le poids de l'ancre et de la corde et/ou chaîne sortie de l'organe de blocage dépasse le poids de celui dans celui-ci et amène l'ancre à tomber librement et amène le cliquet de rochet (15) à être relâché.
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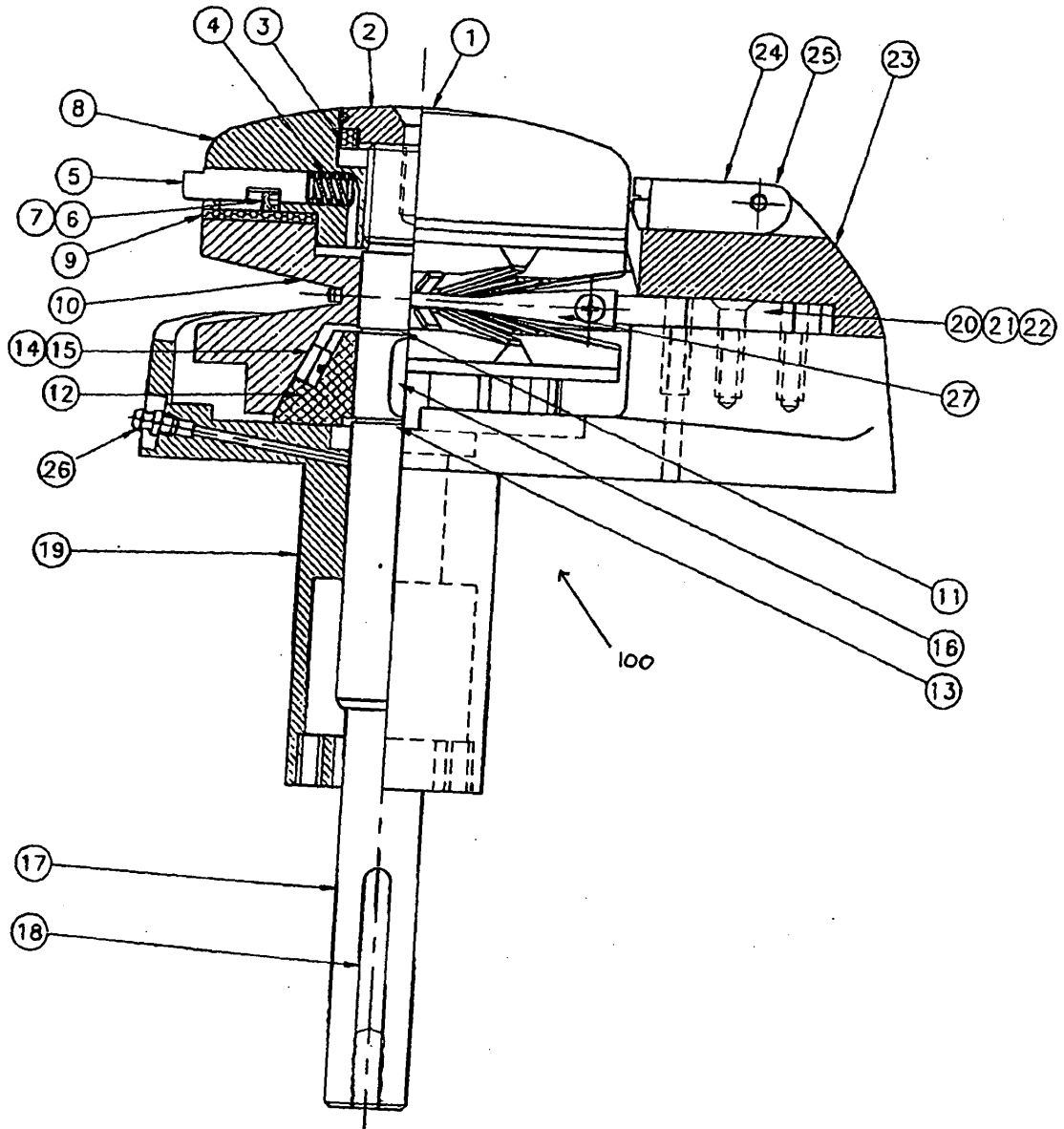


Fig 1

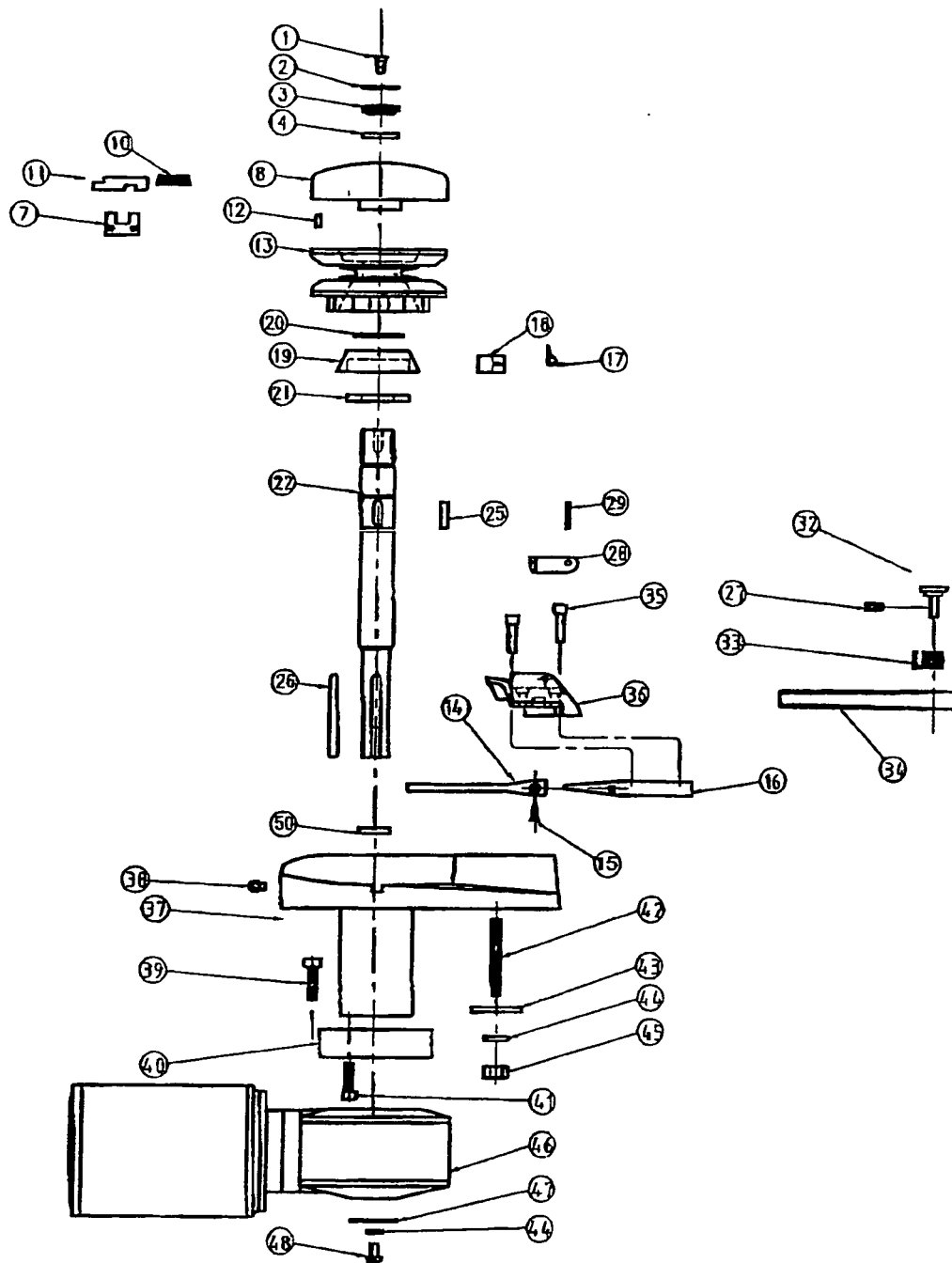


Fig 2.

REFERENCES CITED IN THE DESCRIPTION

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